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Response of Breeding Birds to Commercial Clearcutting of Aspen in Southwestern Colorado

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ORIGINAL

Breeding birds on an aspen forest in southwestern Colorado increased in species diversity after 25% of the timber sale area forest was clearcut in patches of 3 to 20 acres. Bird population density on the forest with clearcuts was not significantly different from that on an uncut forest. Of the 20 species evaluated, six were more and one was less abundant than on the uncut forest.

Keywords: Aspen, clearcutting, birds

Aspen (*Populus tremuloides*) and aspen-conifer vegetation types provide important wildlife habitats in the Rocky Mountains. About 4 million acres of commercial aspen occur within the Rocky Mountain region; 3 million acres are in Colorado (Green and Van Hooser 1983). Aspen stands sometimes support larger populations and greater species diversity of birds than other associated vegetative types (Winternitz 1976).

On many sites, aspen is seral and, if protected from fire or other catastrophic disturbance, eventually is replaced by conifers or other vegetation (Fowells 1965). Because much of the aspen in the Rocky Mountains is overmature, it may need to be regenerated for a variety of management objectives (Jones et al. 1985).

Aspen commonly reproduces by root suckers in stands that have been opened by fire, windthrow, or clearcutting. Clearcuts usually revegetate with aspen, other woody plants, and herbaceous vegetation, and alter the habitat potential for bird species (DeByle 1976). This study reports changes in the bird community within and adjacent to sites that have been clearcut.

Study Site

The West Stoner aspen timber sale area, a mosaic of clearcut and uncut aspen stands, is on a mesa above the West Dolores River, about 25 miles northeast of Dolores, Colo. Elevations range from 9,000 to 10,000 feet, and topography is mostly gentle. The site is occupied by a nearly pure stand of mature aspen. About 10% of the area consists of dispersed, small meadows. Aspen was clearcut throughout the sale area, in patches ranging from 3 to 20 acres, from 1974 through 1978 (figs. 1 and 2). A few subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*), were left standing within clearcuts. About 570 acres (25% of the sale area) were harvested, mostly in 1977 and 1978. Numbers of aspen sprouts in 1979 averaged 1,000, 31,000, and 10,000 per acre in sample plots in uncut, 1- and 5-year-old clearcuts, respectively. Mean heights of the tallest sprouts in the same plots were 1.7, 1.9, and 5.8 feet, respectively (Crouch 1983). Snags were inventoried in selected uncut areas to determine availability of nesting sites for cavity nesting birds (Scott et al. 1980).

Methods

Mature trees and saplings > 1 inch d.b.h. were sampled with a 20-factor prism from 20 stations spaced 200 feet apart on each of the uncut plots; and the number of trees was determined. Effects of clearcutting on the density and species composition of birds were evaluated in 1979. Birds were classified into guilds by feeding and nesting behavior (Szaro and Balda 1979).

For the bird inventory, four 6,000-foot-long transects were established across different segments of the study area. About 30% of the total transect length sampled clearcuts, and the remainder passed through uncut leave strips that separated the clearcut blocks. Four transects

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also were established in uncut aspen outside the sale area to serve as controls. Each transect was inventoried four times from June 12 to June 30.

Bird densities per unit area were calculated by using the average perpendicular observation distance as one-half of the width of the strip censused (Amman and Baldwin 1960). A median observation distance was determined for each species, and only those birds within that distance were used for density estimates. Estimates are based on means of the four inventories. Birds also were classified into guilds by feeding and nesting behavior (Szaro and Balda 1979).

Bird densities on the controls were compared to those on the sale area using the Mann-Whitney U Rank sum test ($P = 0.10$). A diversity profile for birds was prepared following Patil and Taillie (1979).

Results

Basal area was estimated at 149 square feet per acre, with an average of 359 trees per acre ≥ 4 inches d.b.h. Conifers made up only 1% of the total basal area, but accounted for a larger proportion of the foliage volume.

Figure 1.—During the first year after clearcutting, there were 30,000 aspen sprouts per acre averaging 1.7 feet in height.

Figure 2.—In the fifth year after clearcutting, aspen sprouts numbered 10,000 and averaged 5.8 feet in height.

Bird densities on the sale area were similar to those on the controls (table 1). Violet-green swallows, house wrens, pine siskins, and mountain bluebirds were more common on the sale area than on the uncut forest.[3,4] More hairy woodpeckers were present on the controls. More birds in the ground-feeding/cavity-nesting, and picking and gleaning/cavity-nesting guilds were on the sale area than on the controls.

Species diversity and evenness were greater on the sale area than on the controls (fig. 3). Warbling vireos were the most abundant bird species on both the sale area and the controls, and made up 35% and 24% of the bird observations, respectively. The bird diversity curve between the two plots was nearly parallel from 2 to 16 bird species.

Discussion

Flack (1976) counted birds once during the breeding season, in several aspen stands in southwestern Colorado, and reported many of the same species that were found on the controls. He recorded 17 species and an average of 514 birds per 100 acres compared to 24 species and a mean of 225 birds per 100 acres on the controls in our study.

DeByle (1981) described effects of aspen clearcutting on bird populations in Utah. He reported an average of 59 pairs of birds representing 18 species before, and 33 pairs and 23 species after cutting a 10-acre plot. This study found 35 species of birds and estimated 297 birds per 100 acres on the sale area after patch clearcutting.

Birds in the aerial-feeding/foliage-nesting guild were more abundant on clearcuts and on the sale area than on the controls. Hummingbirds, olive-sided flycatchers, and western wood pewees accounted for much of the higher number. Olive-sided flycatchers sang from tops of snags that were near or in openings, but were not observed on the uncut forest. Szaro and Balda (1982) indicated that western wood pewees preferred moderate to heavily disturbed areas. This study usually found the highest density on the sale area, which provided nesting cover adjacent to open areas for feeding.

Numbers of aerial-feeding/cavity-nesting birds were similar on the sale area and the controls. Although others have reported that western flycatchers were not present on clearcuts (Szaro and Balda 1979, Kessler 1979), this study found no difference in number of birds between the sale area and controls. The few residual conifers and aspen trees left on the clearcuts provided perch sites, which probably accounted for the observations of these birds there. Violet-green swallows and tree swallows were observed feeding over the clearcuts but were counted only when perched. Few tree swallows were sighted; but several violet-green swallows were seen perched and nesting in the few dead trees left on the clearcuts.

[3]*Greater or lesser, increases or decreases, etc., indicate that the values reported are significantly different at $P = 0.10$.*

[4]*Common and scientific names of all birds observed on the study area are shown in Appendix 1.*

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Table 1.—Bird population densities (number per 100 acres) on a patch clearcut aspen timber sale and uncut controls on Stoner Mesa, southwestern Colorado.

	1979[1]	
	Sale area	Control
Species		
Broad tailed Hummingbird	4 b	0 a
Yellow-bellied Sapsucker	1	0
Hairy Woodpecker	<1 b	3 a
Northern Flicker	2	1
Western Wood Pewee	18	9
Western Flycatcher	3	9
Violet-green Swallow	13 b	1 a
Mountain Chickadee	2	1
House Wren	29 b	10 a
Ruby-crowned Kinglet	2	<1
Mountain Bluebird	2 b	0 a
Hermit Thrush	2	8
American Robin	11	7
Warbling Vireo	79	86
Orange-crowned Warbler	2	7
Yellow-rumped Warbler	42	49
MacGillivray's Warbler	6	1
Song Sparrow	26 b	10 a
Dark-eyed Junco	24	18
Pine Siskin	14 b	0 a
Other Birds	15	5
Total	297	225
Guilds		
Aerial feeders/foliage nesters	23 b	9 a
Aerial feeders/cavity nesters	16	10
Ground feeders/cavity nesters	4 b	1 a
Ground feeders/ground nesters	33	28
Ground feeders/foliage nesters	28 b	10 a
Pickers and gleaners/foliage nesters	161	150
Pickers and gleaners/cavity nesters	31 b	14 a
Hammerer and tearers/cavity nesters	1	3

[1]*Means within the same species and habitat category followed by no letter or the same letter are not significantly different (P = 0.10).*

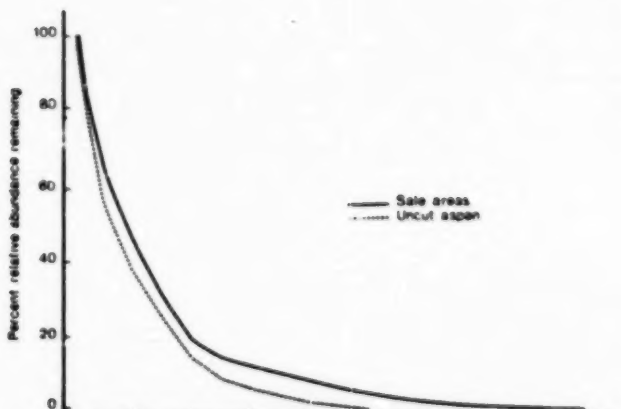

Figure 3.—Bird species diversity profile. Lines in the profile that do not cross indicate differences in species diversity.

Bluebirds (western and mountain) were the only species observed in the ground-feeding/cavity-nesting guild. Both were few in number but tended to favor the sale area. Bluebirds prefer open woodlands (Scott et al. 1975) or lightly to moderately disturbed areas (Szaro and Balda 1982) and usually nest near openings.

Dark-eyed juncos were the most abundant birds feeding and nesting on the ground, and their populations were not different on control and sale area transects. A few white-crowned sparrows and green-tailed towhees were observed on the sale area. Hermit thrushes are considered ground-nesters and usually inhabit undisturbed forests (Szaro and Balda 1979). They were found on the sale area and the controls.

More ground-feeding/foliage-nesters were observed on the sale area. American robins were counted on the sale area and the controls, whereas chipping and song sparrows, and Brewer's blackbirds were found only on the sale area.

Numbers of picking and gleaning/foliage-nesters were not different on the two study areas. Warbling vireos and

yellow-rumped warblers were common on both areas. Pine siskins were more abundant on the sale area than on the controls. Most of the ruby-crowned kinglets that were counted were observed in conifers on both the sale area and controls.

MacGillivray's warblers prefer low dense undergrowth, shady and damp thickets, forest edge, or low brushy areas (Harrison 1975). They were more abundant on the sale area than on the controls. Other birds in this guild, with small populations, were Steller's jay, Wilson's warblers, western tanagers, and pine grosbeaks.

Among picking and gleaning/cavity-nesters, a few black-capped and mountain chickadees were observed on the area. Mountain chickadees were seen mostly in conifers, and black-capped chickadees primarily in aspen. Few red-breasted and white-breasted nuthatches were observed. House wrens, the most abundant species of this guild, preferred the sale area.

Only two species of hammering and tearing/cavity nesters were observed. A few yellow-bellied sapsuckers were observed on both study areas; whereas the density of hairy woodpeckers was higher on the controls than on the sale area.

Conclusions

Habitat changes caused by patch clearcutting in aspen are usually temporary, but provide successional stages favoring several avian species. Cutting of 25% of the sale area on Stoner Mesa appeared to adversely affect few of the forest dwelling birds. DeByle (1981) speculated that clearcutting aspen in small blocks on an 80-year rotation should provide a mosaic of age and size classes, would increase "edge," and should increase bird species diversity and even total number of birds. The results of this study tend to support his speculation· however, shorter rotations or cutting a greater portion of an aspen forest may cause a more serious decline in birds which depend on older forests.

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Appendix 1

Common and scientific names of all birds observed on the Stoner Mesa study area. Species followed by asterisks are included in inventory data.

Common name	Guild[1]	Scientific name
Black-crowned night-heron	WF-WN	*Nycticorax nycticorax*
Canvasback	WF-WN	*Aythya valisineria*
Sharp-shinned hawk	AF-FN	*Accipiter striatus*
Northern goshawk	GF-FN	*A. gentilis*
Swainson's hawk	GF-FN	*Buteo swainsoni*
Red-tailed hawk	GF-FN	*B. jamaicensis*
Blue grouse	GF-GN	*Dendragapus obscurus*
Band-tailed pigeon	PG-FN	*Columba fasciata*
Great horned owl	CF-FN	*Bubo virginianus*
Common nighthawk	AF-GN	*Chordeiles minor*
Broad-tailed hummingbird *	AF-FN	*Selasphorus platycercus*
Rufous hummingbird *	AF-FN	*S. rufus*
Yellow-bellied sapsucker *	HT CD	*Sphyrapicus varius*
Downy woodpecker *	HT-CD	*Picoides pubescens*
Hairy woodpecker *	HT-CD	*P. villosus*
Northern flicker *	GF-CD	*Colaptes auratus*
Olive-sided flycatcher *	AF-FN	*Contopus borealis*
Western wood pewee *	AF-FN	*C. sordidulus*
Hammond's flycatcher *	AF-FN	*Empidonax hammondii*
Western flycatcher *	AF-CD	*E. difficilis*
Purple martin	AF-CD	*Progne subis*
Tree swallow *	AF-CD	*Tachycineta bicolor*
Violet-green swallow *	AF-CD	*T. thalassina*
Gray jay	PG-FN	*Perisoreus canadensis*
Steller's jay	PG-FN	*Cyanocitta stelleri*
Common raven	GF-FN	*Corvus corax*
Black-capped chickadee *	PG-CD	*Parus atricapillus*
Mountain chickadee *	PG-CD	*P. gambeli*
Red-breasted nuthatch *	PG-CD	*Sitta canadensis*
White-breasted nuthatch	PG-CD	*S. carolinensis*
Brown creeper	PG-CD	*Certhia americana*
House wren *	PG-CD	*Troglodytes aedon*
Ruby-crowned kinglet *	PG-FN	*Regulus calendula*
Western bluebird *	GF-CD	*Sialia mexicana*
Mountain bluebird *	GF-CD	*S. currucoides*
Townsend's solitaire *	GF-GN	*Myadestes townsendi*
Hermit thrush *	GF-GN	*Catharus guttatus*
American robin *	GF-FN	*Turdus migratorius*
Warbling vireo *	PG-FN	*Vireo gilvus*
Orange-crowned warbler *	PG-FN	*Vermivora celata*
Yellow-rumped warbler *	PG-FN	*Dendroica coronata*
MacGillivray's warbler *	PG-FN	*Oporornis tolmiei*
Wilson's warbler *	PG-FN	*Wilsonia pusilla*
Western tanager *	PG-FN	*Piranga ludoviciana*
Green-tailed towhee *	GF-GN	*Pipilo chlorurus*
Chipping sparrow *	GF-FN	*Spizella passerina*
Song sparrow *	GF-FN	*Melospiza melodia*
White-crowned sparrow *	GF-FN	*Zonotrichia leucophrys*
Dark-eyed junco *	GF-GN	*Junco hyemalis*
Brewer's blackbird *	PG-FN	*Euphagus cyanocephalus*
Brown-headed cowbird *	GF-PA	*Molothrus ater*
Pine grosbeak *	PG-FN	*Pinicola enucleator*
Cassin's finch	PG-FN	*Carpodacus cassinii*
Pine siskin *	PG-FN	*Carduelis pinus*

[1]*Feeding Guilds*
- *AF - Aerial feeders*
- *PG - Picking and gleaning*
- *GF - Ground feeders*
- *HT - Hammerers and tearers*
- *WF - Water feeders*

Nesting Guilds
- *FN - Foliage nesters*
- *WN - Nests over water*
- *GN - Ground nesters*
- *CD - Cavity and depression nesters*
- *PA - Parasitic*

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